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# REVIEW ON COMPARATIVE STUDY ON EFFECT OF DIFFERENT TYPES OF STEEL FIBERS ON STRENGTH PARAMETERS OF SELF COMPACTING CONCRETE

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*Abstract:* The main objective of this research is analyze the effect of different types of steel fibers on strength parameters of self compacting concrete for M-40 grade of concrete by using fibers like straight fiber, crimped fiber and hooked fiber. Self-compacting concrete is a type of concrete which flows under the influence of gravity without segregation is used in reinforced structural members. It avoids the need of vibration. Steel fibers can resistance to crack, impact and fatigue resistance, reduce shrinkage and toughness. This project investigates the strength studies of self-compacting concrete using steel fibers as reinforcement to enhance. Various tests are to be preformed to determine the properties of fresh and hardened concrete such as workability test, compressive test, flexure and tensile test of SSC containing fibers of 1%, 2% and3%, by volume of cement.

. Keywords: self-compacting concrete, different types of steel fibers, M40 grade concrete, properties of fresh and hardened concrete

## I. INTRODUCTION

Self Compacting Concrete was first developed in Japan in the year 1980. Prof. H. Okamura of University of Tokyo, Japan; is mainly responsible for initiating and initial development of this concrete and is now regarded as the Father of SCC. The need for the development of SCC arose from the skilled labor and man power in Japan during 1980's. Self-compacting concrete has been represent "the most progressive improvement in concrete development". Self-compacting concrete is a concrete which exhibits good flow properties, good passing ability, and segregation resistance. No vibration is required to compact the concrete since the SCC has the capability of compacting under its own weight after being placed. it has proved to be beneficial for the Speedier development, Reduction in site labor, Better surface , Easier putting, Improved durability, Greater flexibility in outline, Thinner concrete sections, Reduced noise level, Safer working environment.

The importance of self-compacting concrete is that maintains all concrete's durability and characteristics, meeting expected performance requirements. Compaction is hard to be done in conditions where there are dense reinforcement and large placing area. The addition of fibers in concrete upgrade the tensile strength, flexural strength, toughness, drying shrinkage, and failure pattern of the concrete.

The fiber concrete is prepare by using different types of fibers. The fibers are mainly classified in two groups as metallic and non-metallic fibers. Here, we will mainly discuss Steel Fiber. The Steel fiber concrete is a composite material made of cement, fine aggregate and coarse aggregates and steel fibers. In tension steel fiber concrete fails only after the steel fiber breaks out of the cement matrix. The Steel fiber concrete possess many dynamic performances such as high resistance to explosion and penetration as compared to traditional concrete.

The study of Self-Compacting Concrete with Steel Fibers (SCCSF) has [observed that due to the benefits of having more ductile and higher tensile strength as compared to conventional concrete. Besides, depending on the structures, the use of steel fibers can reduce the required amount of conventional steel reinforcement. However, the addition of steel fibers into SCC may affect the fluid property of the concrete. Such as, if the fibers is increased in [volume fraction and aspect ratio will decrease the flow of slump and ability to pass, while increasing the flow time of SCCSF.

For that reason, this study helps to recognize the effect of selected steel fibers on the workability of SCC and how it can affect the hardened properties of concrete especially in mitigating crack propagation.

## II. AIM & OBJECTIVE

The present research aims at investigating the effect of straight fiber, crimped fiber and hooked fiber on strength parameters of self compacting concrete for M-40 grade of concrete:

- To improve the tensile, Compressive and Flexural strength.
- Delaying propagation of micro- or macro-cracks according to geometrical parameters of fibers.
- Impact and fatigue resistance.

## III. LITERATURE REVIEW

A significant amount of research work on SSC with steel fibers and their mechanism has been published by many authors. Review of some of the research paper are briefed below:

3.1 "Effect of Different Types of Steel Fibers on Strength Parameters of Self Compacting Concrete".
Yaseen Patel1, Nadeem Pasha2, Dr S.K.Mohammed.Azam3,

This study is based on investigating the effect of different types of steel fibers on strength parameters of self compacting concrete for M-40 grade of concrete using fibers like straight fiber, crimped fiber and hooked fiber. forM40 mix proportion of concrete was 1:1.79:2.54 and maintaining water cement ratio =0.35 in order to analysis the compressive strength, Split tensile strength, flexural strength, of steel fiber reinforced concrete (SFRC) containing fibers of 1%, 2% and 3% by volume of cement. Result data clearly shows that in 28 days there is increase of strength in Compressive strength, Flexural strength and Split Tensile strength upto 3% of addition of steel fiber for M-40 Grade of Concrete.

3.2 "Effect of steel fibers on self-compacting concrete slump flow and compressive strength".
N Majain1, A B A Rahman1, R N Mohamed1 and A Adnan,

Since Self-Compacting Concrete (SCC) was introduced, various attempts have been made to further identify its quality. In SCC mix addition of steel fiber is found to have increased the hardened properties of concrete. However, it is also found that the addition of steel fibers into the fresh SCC mix poses a adverse effect on the workability which may cause segregation and bleeding. Thus, some modifications are required on the mix proportions to attain a good flowability without bleeding and segregation. In this study, there are four types of mixes were prepared which comprising of normal concrete (NC), SCC and Self-Compacting Concrete with Steel Fibers (SCCSF) with two volume fractions of still fibers 0.5% and 1.0%.

3.3 "Effect of Steel Fibers on Strength of Concrete".
A.G. Dahake and K. S. Charkha,

The research work deals with the effect of different types of steel fibers on various strengths of concrete are investigate. The various steel fibers at a constant rate of 2.5 % by the weight of cement are used for this research work. Various strengths considered for experimental work such as compressive strength and flexural strength. Results obtained are of different researchers and their experimental comparison of results of steel fiber reinforced concrete with that of normal concrete showed the significant improvements in the results of compressive strength and flexure strength of concrete with different types of steel fiber with various constant volume fractions and different aspect ratio

3.4 "EXPERIMENTAL STUDY ON SELF COMPACTING CONCRETE WITH STEEL FIBRE REINFORCEMENT"
Thomas Paul, Habung Bida, Bini kiron, Shuhad A K, Martin Varghese,

Self-compacting concrete (SCC) is determine as a flowing concrete mixture which has the ability to flow under its own weight. The flowing property of SCC makes it easier to placing it in difficult conditions. The purpose of this research work is use of steel fibers in self-compacting concrete to achieve the physical properties of self-compacting concrete. The objective of the work was to found and compare the differences in properties of ordinary concrete, SCC, and SCC with steel fibers at different proportions. This experiment was performed to study the compressive strength, flexural strength, Split tensile strength of steel fiber reinforced concrete (SFRC) containing fibers of 0%, 0.4%, 0.8% and 1.2%. Steel fiber of aspect ratio 75 was used. The data has been analyzed and compared with a specimen having 0% steel fiber. The workability of SCC significantly reduced as the percentage of fiber increases. The research paper proposes that due to these properties of steel fiber reinforced self-compacting concrete, it can be used at places where compaction is not achieve.

3.5 "Effect of fibers types on fresh properties and flexural toughness of self-compacting concrete".
Abdullah M. Zeyad,
This research purpose to experimentally analyze the workability and mechanical properties of self-compacting concrete (SCC) with silica fume (SF) and different types of fibers. Five types of fibers, namely, hook-end steel (H), mild steel (M), carved-steel (S), basalt rock (R), and polypropylene (P) fibers, were used to produce fiber-reinforced SCC (SCRFC). Every fiber type was mixed to the SCC at a proportion of 0.25% of the concrete volume, and a silica fume replacement added of 30% of the cement mass was combine. The workability of fresh concrete samples was get using slump flow, slump flow T50, L-box, V-funnel, V-funnel T5, bleeding, and segregation tests. In addition, the overall strength of hardened concrete was observed by using compressive, indirect tensile, and flexural strength tests.

3.6 "Effect of steel fibers on the properties of recycled self-compacting concrete in fresh and hardened state".
M.M. Kamal1, M.A. Safan1, Z.A. Etman1, M.A. Abd-elbaki,

The current research deals to study the possibility of making fiber recycled self-compacting concrete (FRSCC) using demolitions as a coarse aggregate (crushed red brick and crushed ceramic). Steel fibers were used in recycled self-compacting concrete (RSCC) to enhance fresh and hardened properties of this concrete. Thirty nine concrete mixes were prepared to achieve the aim proposed in this paper work. Steel fiber can be mixed varied from 0 to 2.0% by the volume of concrete with aspect ratio 65. The fresh properties of FRSCC were analysis using slump flow, J-ring and V-funnel tests. Compressive strength, tensile strength, flexural strength and density tests were performed in order to observed mechanical properties. The optimum volume fraction of steel fibers was 0.25% and 1.0% for the mixes contained crushed red brick and ceramic replace as a coarse aggregate respectively. At optimum percentage of steel fibers, the compressive strength for the RSCC mixes with steel fibers; improved by 11.3% and 31.8% for the mixes with crushed ceramic and crushed red brick, respectively with respect to control mix. Also the tensile strength and the flexural strength for the mixes were improved.

3.7 "MECHANICAL PERFORMANCE OF STEEL FIBER REINFORCED SELF-COMPACTING CONCRETE IN PANELS". Salem G. Nehmea, Roland Lászlób ,Abdulkader El Mirc,

This experimental work significant to study the mechanical properties of the steel fiber reinforced self-compacting concrete (SFR-SCC) panels. To perform this, the rheological and mechanical characteristics of SFR-SCC mixtures were evaluated. Slump flow diameter and V-funnel flow time tests were determined to get the fresh properties. The compressive strength, and the maximum deflections were recorded for the SFR-SCC panels, applying three different steel fiber contents. Constant parameters were defined as the following: water to cement ratio (w/c = 0.51), panel geometry (500 ×500× 50mm), and fiber type (DRAMIX RC65/35 BN 35). The results revealed that the workability of SCC mixtures is reduced by increasing the steel fiber proportion. However, the load deflection capacity is increased by using the steel fibers.

3.8 "Experimental investigation on hybrid steel fibers reinforced self-compacting concrete under flexure"
Maágorzata Pająka, Tomasz Ponikiewski

Using the self-compacting concrete (SCC) can help to reduce time and less the costs of the building process. The addition of distributed steel fibers into SCC increased its tensile strength. The steel fibers can be helpful in delaying propagation of micro- or macro-cracks according to geometrical parameters of fibers.. In the research paper, the combinations of straight and corrugated steel fibers with different lengths (6 mm, 35 mm) and cross-sectional shape on the compressive strength and flexural strength of SCC was observed. The total fibers volume contains varied from 1.0 % to 3.0 %. Among the rheological parameters of self-compacting concrete, the hybrid fibers reinforcement did not affect workability but pronouncedly enhance flowing ability. Thus, the mixes reinforced with the highest fibers volume ratios did not achieved the requirements for the SCC. Based on the mechanical test results no adequate difference in the compressive strength was found. The results showed that the flexural parameters were pronouncedly enhanced in the HFR-SCC due to the hybrid fiber addition and at low dosage rates depended on the proportions between the two applied types of fibers.

## IV. Conclusion On Literature Survey

In order to achieve high quality SCC and SFR-SCC mixes, it is essential to strictly follow the recommended mixing procedure. This procedure with the given mix proportions has lead to an SCC mix that was able to flow and fill the moulds without any need of vibration.
In conclusion, the addition of steel fibers into the SCC mix may affect the workability and fluidity of the fresh SCC and causes segregation and bleeding in the mixtures.
The inclusion of steel fibers in SCC have increased the compressive strength of concrete and changes the failure modes.

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